CORRESPONDENCE

# Public-Access Defibrillation in Japan

**TO THE EDITOR:** In their study of the effect of public-access defibrillation on outcomes after out-of-hospital cardiac arrest in Japan, Kitamura et al. (Oct. 27 issue)[1] found an improved survival rate when a publicly accessible automated external defibrillator (AED) was used in the field. However, the frequency of AED use by bystanders before the arrival of emergency medical service (EMS) personnel remained very poor (approximately 2% of witnessed arrests of cardiac origin).

As compared with patients who did not receive public-access defibrillation, those who did had nearly twice the rate of cardiopulmonary resuscitation (CPR) (99.4% vs. 51.3%, P<0.001), and the bystanders required dispatcher instructions less frequently during CPR. These findings suggest that patients who received public-access defibrillation were treated by trained bystanders, who were aware of the importance of CPR and of how to perform it.

The higher survival rate observed in this group highlights the importance of education, which most probably improved the rates of both public-access AED use and bystander CPR. In addition to AED use, bystander education constitutes the other component of any public-access defibrillation program[2,3] and must be a priority.

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No potential conflict of interest relevant to this letter was reported.

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**TO THE EDITOR:** Missing from the report by Kitamura et al. on survival with public-access defibrillation in Japan was a consideration of the cost-effectiveness of the program. The presence of 428,821 AEDs was credited with producing 201 survivors of out-of-hospital cardiac arrest with a favorable neurologic outcome in 2013. The typical price of an AED is $1,500 to $2,000, with an average warranty of 7 years.[1] Ongoing costs include the battery, at $400 with a life of 4 years, and pads, at $50 with a life of 2 years.[1] Additional expenses include maintenance (periodic tests and inspections), administrative costs, and training costs for personnel. I estimate an annual cost per AED of at least $500, yielding a cost per survivor in excess of $1 million. At an average age of 65 years, survivors might gain an additional 10 years of life,[2] yielding a cost of $100,000 per year of life gained. Adjusting for quality of life and increased health care costs in these older, fairly sick persons (most of whom would have to live with an implanted defibrillator) would raise the cost considerably above $100,000. This amount of money seems to exceed the commonly accepted definitions of cost-effective treatment.

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**TO THE EDITOR:** We have two concerns with the study by Kitamura et al. First, the authors adjust for some cardiac arrest characteristics but not for the location of arrest. A good outcome is more likely in public settings than in private settings.[1,2]

Although some of this association may be explained by factors such as the use of bystander CPR and the initial rhythm, for which the authors adjusted, other important factors such as coexisting conditions and the quality of bystander CPR, which may be related to the location, were not adjusted for in the study. Because the location of arrest is included as an Utstein variable,[3] we urge the authors to adjust for this.

Second, the authors included patients with witnessed, ventricular-fibrillation cardiac arrest with a cardiac cause. Because AEDs are applied to all cardiac arrests without prior knowledge of the rhythm or cause of arrest, the study by Kitamura et al. gives a misleading picture of the potential benefit of AEDs. The use of AEDs in patients with a nonshockable rhythm may be harmful owing to delays and interruptions in CPR.[4] We encourage the authors to analyze the entire cohort.

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**THE AUTHORS REPLY:** We agree with Karam et al. about the importance of bystander education in public-access defibrillation programs. Efforts to increase the number of trained citizens would increase the rate of both CPR and AED use by lay rescuers, leading to an increase in survival with a favorable neurologic outcome after out-of-hospital cardiac arrest.

The economics of public-access defibrillation is an important issue, as suggested by Bassan. The cost-effectiveness of public-access defibrillation programs is still controversial. The Public Access Defibrillation Trial estimated that the cost-effectiveness of public-access defibrillation was similar to that of other medical interventions,[1] whereas another report mentioned that a nationwide public-access defibrillation program including dissemination of public-access AEDs is less likely to be cost-effective.[2] Importantly, the cost-effectiveness of public-access defibrillation is influenced by not only the number of AEDs but also the rate of AED use and the quality of both CPR and AED use. Therefore, cost-effectiveness should be examined after making efforts to maximize the rate of AED use with bystander education or the effective use of social-media technologies.[3]

Andersen et al. raise concerns about the lack of information on arrest location and on overall AED use (i.e., AED-pad application). Unfortunately, unlike the Utstein Osaka Project registry,[4,5] the All-Japan Utstein Registry of the Fire and Disaster Management Agency did not have data on location or on AED pad application. Therefore, our study used type of bystander (family member or other) as a surrogate for location in the multivariable model, and this variable was well-balanced between the groups in a propensity-score–matching analysis (Table 1 of our article). In addition, because we do not have information on AED pad application, we focused on patients with bystander-witnessed ventricular-fibrillation arrests as the target population. The use of AEDs in patients with nonshockable rhythms may have a negative effect, whereas AED use may be beneficial if it encourages lay rescuers to perform CPR. Analysis of the entire cohort, with data on AED pad application, would be needed to address this question, as suggested by Andersen et al.

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Since publication of their article, the authors report no further potential conflict of interest.

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